

Bridge weigh-in-motion system and Structural Health Monitoring using fiber optic sensors

Lydon, M. (2016). Bridge weigh-in-motion system and Structural Health Monitoring using fiber optic sensors. In Advances in Concrete Bridges Conference Proceedings 2016. Conference Bridge Development Group (CBDG).

Published in:

Advances in Concrete Bridges Conference Proceedings 2016

Queen's University Belfast - Research Portal:

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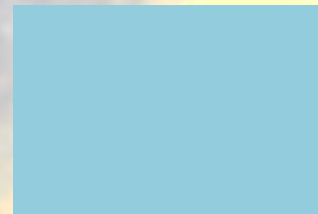
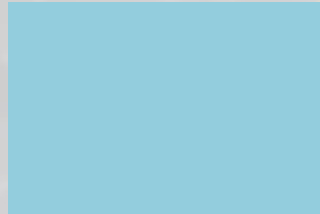
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Queen's University Belfast

Dr Myra Lydon – Intelligent Infrastructure group

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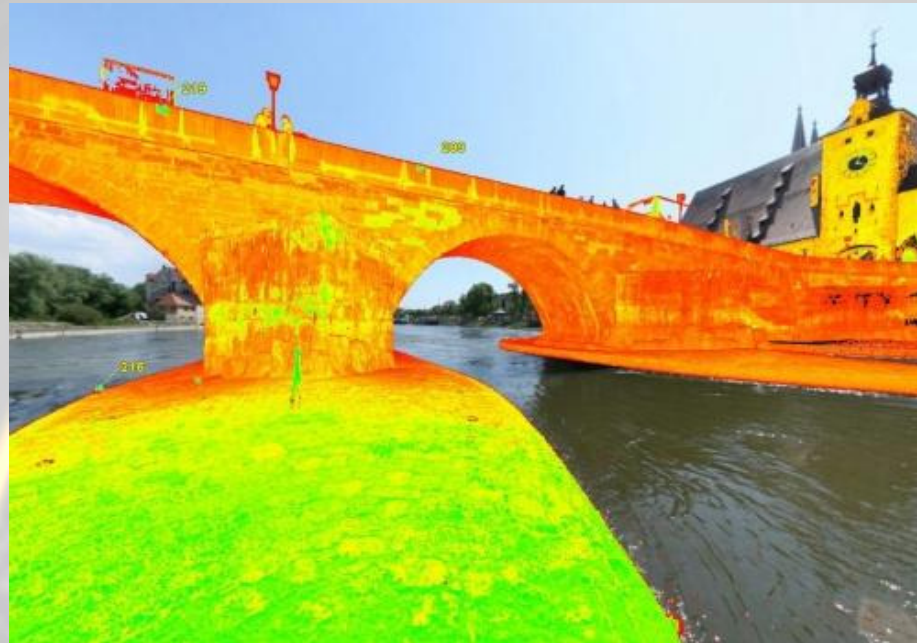
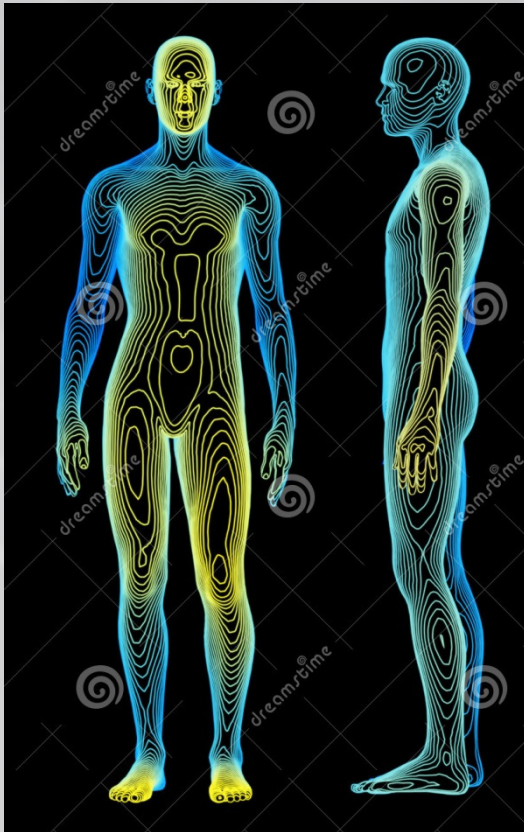
22nd June 2016



WHAT?

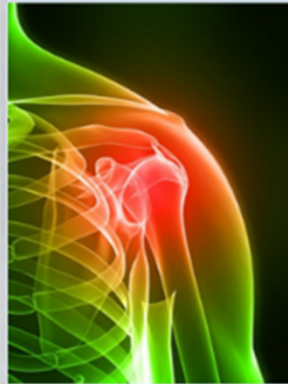
Structural Health Monitoring (SHM)

SHM is a means to enable a structure to generate and communicate information concerning changes in its structural health condition, potential damage and deterioration



Structural Health Monitoring (SHM)

Detect
Recognise
Localise
Quantify



Pain



Exam and Diagnosis



Cure

Or

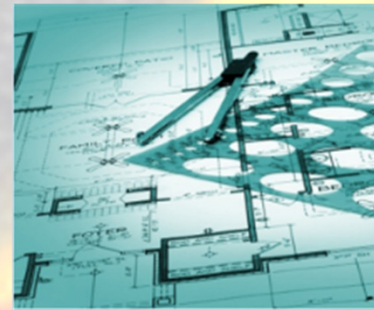
Detect
Inform



Defect



Inspect



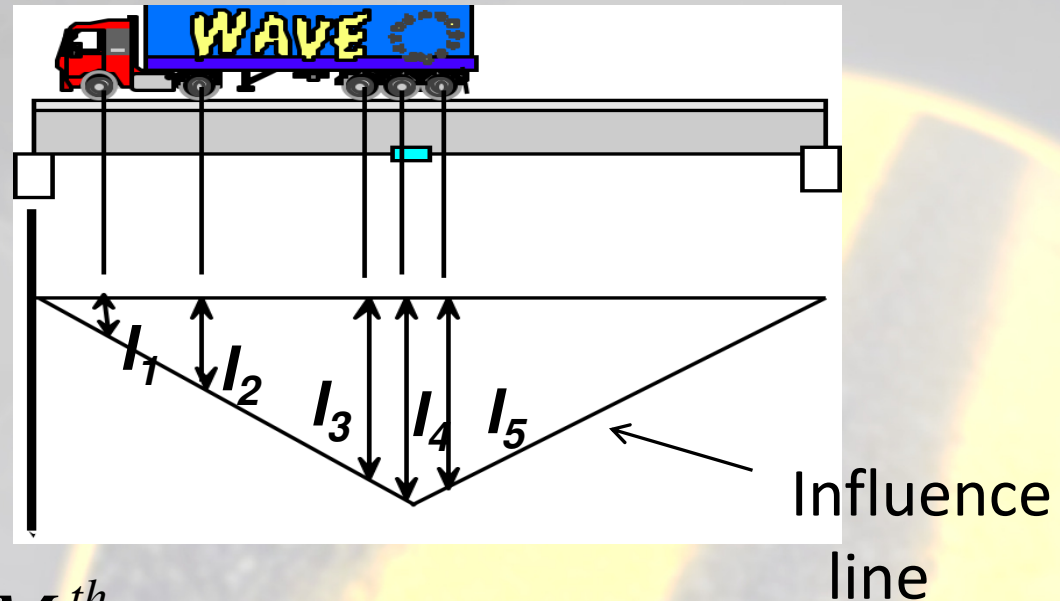
Diagnosis



Repair

Bridge Weigh-in-Motion (B-WIM)

Bridge WIM Concept:



$$M_A^{th} = W_1 \times I_1 + W_2 \times I_2 + \dots$$

WHY?

Increased loading:

- A large amount of the bridges across the world are reaching the end of their design lives
- the intensity and type of loading induced is very different from those anticipated at design stage
- There is a requirement to retain infrastructure for longer and enhance its capacity



Structural Challenges:

- Materials have inbuilt imperfections/flaws
- Degradation and wear from corrosion, fatigue or systemic overloading



Structural Challenges:

- Some older structures were not designed for modern demands
- Changes in the environment impose higher loads such as wind loads
- Extreme events such as impact damage , flooding or vandalism



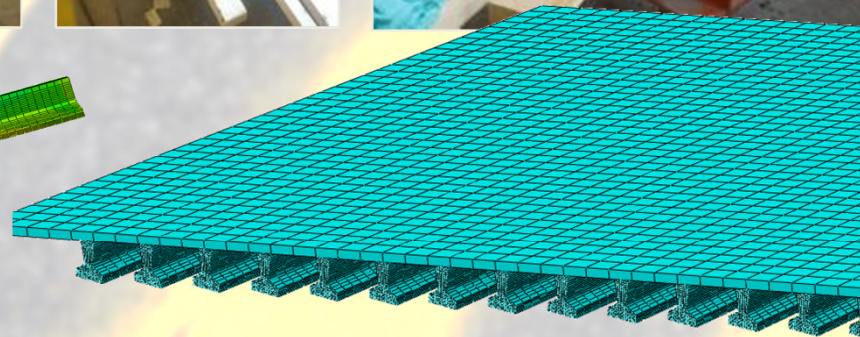
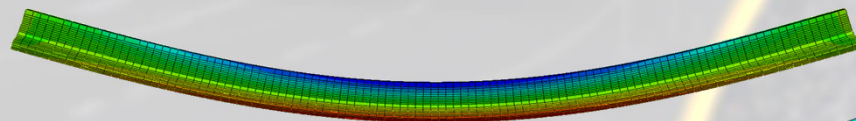
Our Solution

Bridge site Loughbrickland, Co. Down:



B-WIM System development

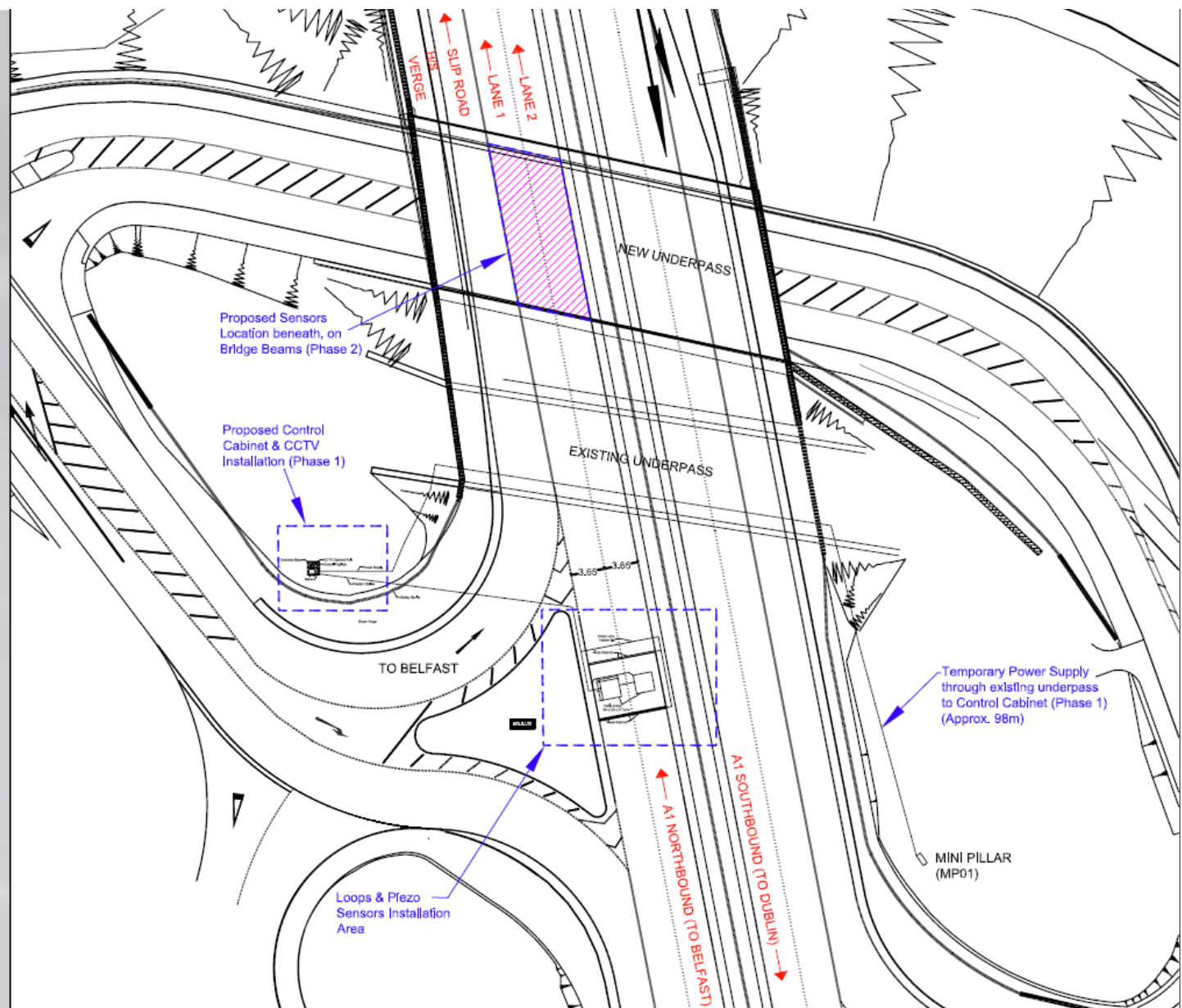
- Lab trials and Finite Element modelling carried out to determine critical sensor locations and predict bridge behaviour



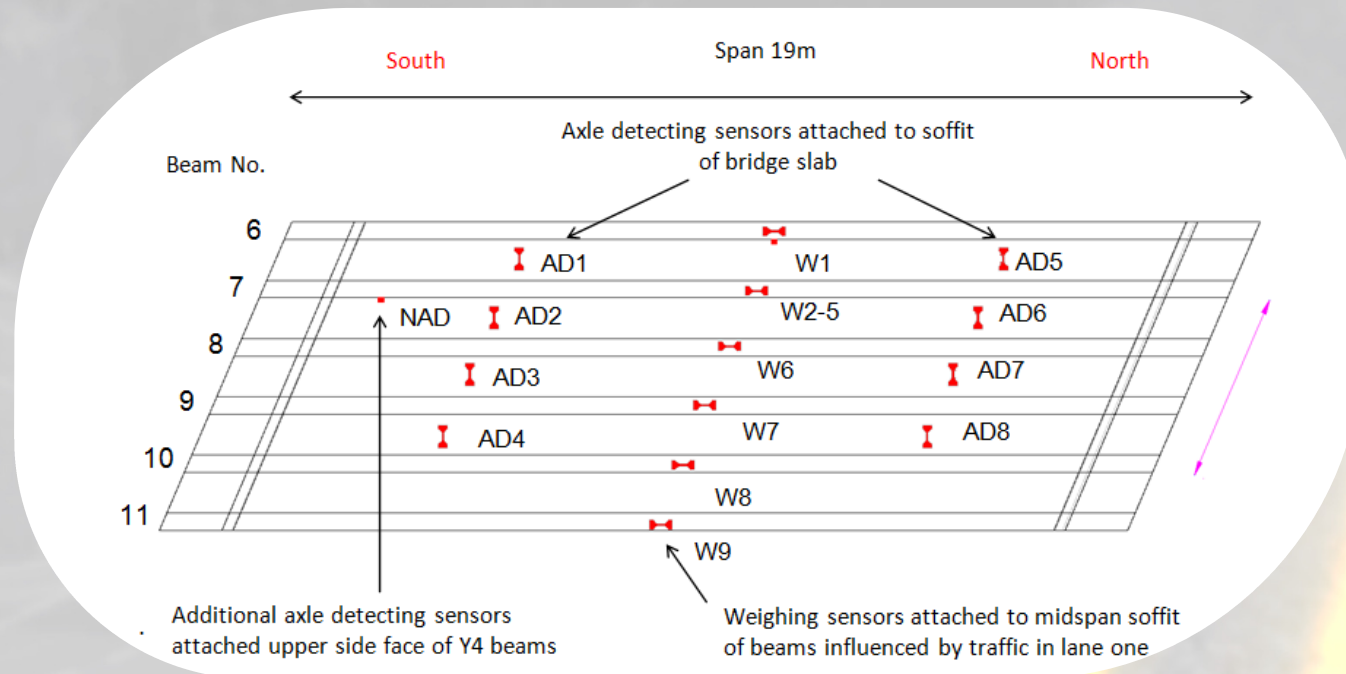
B-WIM System development



B-WIM Installation layout



B-WIM Installation



B-WIM Calibration



B-WIM Accuracy

B(10)
GVW

Successful new method of axle detection





THANK YOU



Queen's University
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Dr Myra Lydon – Queens University Belfast



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